

U. S. DEPARTMENT OF COMMERCE

# TECHNICAL NEWS BULLETIN OF THE BUREAU OF STANDARDS

ISSUED MONTHLY

Washington, December, 1930—No. 164

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## PROGRESS ON INTERNATIONAL STANDARDS OF LIGHT AND ELECTRICITY

For several years negotiations have been in progress toward new international agreements on units and standards for electrical measurements. The latest step was a meeting of an international Advisory Committee on Electricity held in Paris, June 23, 24, and 25, 1930. The minutes of this meeting have just been published so that an authoritative statement can be made regarding its conclusions.

The Advisory Committee on Electricity is a subsidiary of the International Committee on Weights and Measures, having a membership limited to 10. Eight members have been appointed, including one representative each from the national laboratories of Germany, Great Britain, Japan, Soviet Republics, and the United States, and one from the Laboratoire Central d'Électricité at Paris. The other two members appointed are the director of the International Bureau of Weights and Measures and Prof. L. Lombardi, of the Royal School of Engineers at Rome.

The advisory committee met first in 1928 when it adopted resolutions looking definitely toward the establishment of electrical units based directly upon the centimeter-gram-second system instead of upon arbitrary standards, such as the mercury ohm tube and silver

voltammeter which are the basis of the present international units.

In 1929 the International Committee on Weights and Measures approved these proposals of the advisory committee and asked for continued assistance on electrical units and standards. It also decided to take up the problem of obtaining international agreement on measurements of light, and instructed the same advisory committee to consider methods, units, and standards for such measurements. Consequently, the 1930 meeting of the advisory committee was devoted largely to this new problem.

A considerable part of the proceedings centered around documents submitted by the Director of the Bureau of Standards entitled "Photometric Units and Methods," and "Proposals Concerning the Primary Standard of Light." In these documents it was proposed that a "black-body" radiator at the freezing point of pure platinum be adopted as the primary standard of light. This type of standard was originally suggested by Waidner and Burgess in 1908, but has only recently reached the stage of actual realization in a satisfactory form through work which has been carried out in the laboratories of the bureau. (See Technical News Bulletin No. 151, p. 107; November, 1929.)

The conclusions reached by the advisory committee with regard to standards of light were expressed in the

following resolutions (translated from the official French text):

(A) Primary standard of light.

1. The Advisory Committee on Electricity supports the opinion of the International Commission on Illumination that a black-body radiator operated under specified conditions should be adopted, at the present stage of technical development, as the primary standard of light.

2. The advisory committee requests the several national laboratories to examine the specifications for the construction and operation of the black-body standard submitted by the Bureau of Standards, and to give their opinions regarding the practicability of adopting the standard thus specified.

3. The advisory committee recommends that additional determinations of the brightness of the black-body radiator be made, especially under the conditions prescribed in the proposed specifications or at least under conditions comparable with those prescribed.

(B) Units of light.

1. The advisory committee believes that it would not be expedient to change the unit which has been in common use in several countries since 1909, and which has been adopted by the International Commission on Illumination.

2. The advisory committee expresses the hope that all countries may accept this unit as soon as pending questions (regarding photometric measurements) are settled.

(C) Maintenance of units.

1. The advisory committee proposes that the national laboratories immediately exchange and compare groups of carbon-filament lamps, or of others operated at a corresponding color, and submit for the International Committee on Weights and Measures precise information regarding the relative values of the units of candlepower as now maintained in the several laboratories.

2. Assuming that any differences disclosed by such comparisons will be removed by agreement among the national laboratories, the advisory committee proposes to make periodic comparisons in the future under the auspices of the international committee.

3. Recognizing the importance of uniformity and continuity in the values of the practical secondary standards, the advisory committee recommends that any future adjustments of these values which may become necessary as a result of reference to the primary standard shall be made by international agreement approved by the International Committee on Weights and Measures.

(D) Secondary standards for diverse colors of light.

1. The advisory committee recognizes the importance of the cooperative studies now being made by the national laboratories on the measurement of transmission of colored filters, and expresses the hope that these studies will lead to agreement on a standard method for making such measurements as well as to accepted values for the particular filters.

2. The advisory committee will be pleased to receive for its own information and for transmission to the International Committee on Weights and Measures any reports on the progress of these studies which can properly be published.

With regard to electrical units and standards, the following conclusions were reached:

1. With regard to the unit of resistance, the ohm, considering that methods of determining the absolute ohm are sufficiently advanced and that the agreement between the measurements of the coils (secondary standards) of the different laboratories remains within the limits of precision of the measurements, it is

not necessary at present to undertake further comparisons of the resistance coils with mercury ohms.

2. As to the units of electromotive force, on the contrary, the international comparisons of standard cells show differences, exceeding the limits of possible precision, between the values of the electromotive force of the standards of different countries. The committee considers that it is absolutely necessary to make new determinations of the electromotive force of the international Weston cells in each national laboratory by means of the silver voltammeter.

The conditions under which the silver voltammeter should be used are specified sufficiently in the report of the international committee which met in Washington in 1910. The advisory committee recommends, however, that the national laboratories use the Smith or the Kohlrausch voltammeter, avoiding organic material, which is detrimental to the electrolytic deposit.

The groups of Weston cells prepared in the several laboratories can be considered as sufficiently constant until the absolute unit of current shall be established.

The advisory committee also made recommendations regarding the equipment of the International Bureau of Weights and Measures and plans for cooperation between that bureau and the national laboratories in work on electric and photometric standards. Since an international General Conference on Weights and Measures is to be held in 1933, the advisory committee decided that it should meet again before that time to study the comparisons of standards which shall have been made and to assign values in absolute units for the standards of resistance and of electromotive force.

#### NATIONAL STANDARD FOR TESTING POWER-LINE INSULATORS

A further step in the nation-wide protection of high-voltage electrical transmission lines which have been put into service throughout the country during the past several years to carry power at voltages as high as 220,000 was taken on October 15 with the approval by the American Standards Association of a national standard for testing power-line insulators.

This standard, prepared through the cooperation of the American Institute of Electrical Engineers, the National Electrical Manufacturers Association, the National Electric Light Association, the National Bureau of Standards, and other organizations concerned with high-voltage transmission, assures against insulator failure the lines carrying an increasing percentage of the nation's power supply.

The standard will enable laboratories in New York and in California to use the same authoritative tests to determine the reliability of insulators. In several of the laboratory tests, voltage

applied to the insulator is increased at the rate of 10,000 volts every 15 seconds until failure occurs. The final voltage must be far above the greatest voltage which the insulator either singly or in series with other insulators will be required to withstand.

It is pointed out that the suspension insulators used for cross-country transmission lines must be tested not only for their resistance to high voltages, but also to the tremendous stresses set up by wind and by the ice which may cover the lines in winter, especially since the transmission towers from which the lines are suspended by means of the insulators are in some places as much as a mile apart.

#### AERONAUTIC RADIO DEVELOPMENTS

Progress can be reported in the development of a combined transmitter for the simultaneous broadcast of radiotelephone and visual type radio range beacon signals. This is designed to remove the principal limitation on the present radio aids to air navigation, viz, that the pilot receives no beacon service while receiving weather or other telephonic information. A master oscillator controls simultaneously a radiotelephone transmitter and a beacon transmitter. The former supplies the carrier-frequency waves and the speech-modulated waves to an open antenna. The latter supplies only the radiobeacon side bands to the beacon loop antennas. Filter arrangements and automatic volume control have been worked out to facilitate the reception of these signals aboard the aircraft. The fundamental adjustments necessary in the experimental model of this transmitter have been completed, and performance tests begun at various distances from the station. A number of tests were made approximately 125 miles from the transmitting station; in these tests successful reception of both the voice and beacon signals was accomplished, with indications that this reception could be obtained over greater distances. Satisfactory sharpness of beacon courses was obtained. As a result of these and other tests the feasibility of the combined service is assured.

For some months a detailed study has been in progress on the characteristics and performance of airplane receiving antennas of various types. One object of this investigation was to find an antenna arrangement having the same desirable electrical characteristics as the vertical pole antenna, but free from the problems of mechanical vibration and ice formation encountered in the use of the pole

antenna. One of the advantages of the vertical pole antenna is its freedom from course errors in radio range beacon reception. A number of different antenna arrangements have been studied, both by theoretical analysis and by practical observation in the air and on the ground. For each antenna studied, the tests in the air included observation of the received voltage, the localizing effect or variation of the received voltage in the immediate vicinity of the beacon tower, and the course errors as observed by circling the beacon. These were compared directly with results obtained using the vertical pole antenna. The antenna arrangements studied included the inclined antenna, with both forward or backward inclination (one example of the latter being the trailing wire antenna); the horizontal dipole antenna; the horizontal V antenna; the horizontal L antenna; the inclined V antenna; the symmetrical transverse T antenna; and the symmetrical longitudinal T antenna. The symmetrical longitudinal antenna with a vertical lead-in was found to have an advantageous combination of the desired operating characteristics. The two flat top elements lie along a line parallel to and directly above the axis of the fuselage, held by short vertical supports, considerably shorter than the usual pole antenna (10 to 18 inches instead of 5 to 6 feet). Equivalent effective height is secured through the use of the flat top. It is essential that the longitudinal T antenna be located in a position such that the electrical effect of the airplane frame acting as the counterpoise is symmetrical; this is not always possible in the case of open cockpit airplanes, but is usually possible in cabin airplanes. This type of antenna is free from course errors in radio range beacon reception. It is superior to the vertical pole antenna structurally, and in respect to ice formation, mechanical vibration, and aerodynamic resistance.

The bureau has begun preliminary work on the development of a radio system to aid in preventing collisions between airplanes. The aim is to give automatic warning to an airplane of the presence and approximate position of any other airplane within a radius of about 3 miles from it. A fundamental limitation is that only one frequency or, at most, a very few frequencies can be made available for this service. The system involves the continuous transmission of ultra high-frequency radio waves from each airplane. Directivity of reception or transmission, or both, will inform the pilot of the direction of danger.

# INSTRUMENTS FOR MEASURING REFRACTIVE INDEX OF OPTICAL GLASS

The supposed necessity for using large prisms and telescopes when making accurate measurements on the index of refraction of optical glass has been investigated recently in the optical instruments section of the bureau, and it was found that a 60° prism with edges measuring three-eighths of an inch in length is sufficiently large for use with the most accurate apparatus now available. This work required a determination of the accuracy which is possible in pointing a telescope at a suitable target and also of the way in which this accuracy may vary as larger telescope lenses are used. Another matter depending on prism size is the error made in properly orienting the prism around a vertical axis when measuring its refractive properties. This difficulty is shown to be less important than generally has been supposed, and a satisfactory method of correcting for such small errors is suggested. It is concluded that large telescopes and special methods for correctly orienting the prism are unnecessary in the most accurate measurements of this kind. As a result, small prisms may be used with confidence when testing optical glass for those small but harmful variations in optical density which may be found within a sample intended for use in constructing an optical instrument of high precision.

This investigation will be discussed at greater length in the January, 1931, number of the Bureau of Standards Journal of Research.

# SOLARIZATION AND REJUVENATION OF WINDOW GLASS

In previous reports attention was called to the rejuvenation in ultra-violet transmission of special window glasses on exposure to the sun after exposure to the mercury arc, which emits short-wave length ultra-violet rays not present in sunlight.

During the past summer there has been observed a similar phenomenon of rejuvenation in ultra-violet transmission on exposure of the glass to sunshine filtered through a blue-green glass that is opaque to wave lengths shorter than 340 millimicrons, after solarization by exposure to full sunlight. This solarization and rejuvenation have been carried through several cycles.

Since solar rays of wave lengths shorter than about 305 millimicrons are absent in winter sunlight, it may be expected that the solarization caused in

summer sunlight will be partly rejuvenated by exposure to winter sunlight. The likelihood of such an occurrence has been under investigation for three seasons, and while the data thus far obtained indicate a possible slight increase in transmission in winter, it amounts to less than 1 per cent, which is barely larger than the errors of observation and requires an averaging of data on more than two score samples. From this it is evident that the possibility of recovery in transmission during the winter will be of no use in sales promotion; particularly so when considered in connection with the fact that the wave lengths (at 302 and lower) at which this increase in transmission may occur, are absent in winter sunlight.

# ULTRA-VIOLET REFLECTING POWER OF HYB-LUM

"Hyb-lum" is a recently marketed alloy of aluminum, in which the alloying elements, amounting to about 2 per cent, are mainly nickel and metals of the chromium group. It is being used in reflectors of therapeutic lamps. Hence, the question arose as to its reflectivity of ultra-violet rays.

The samples examined had a good polish. The reflecting power in the short wave length ultra-violet, at 300 millimicrons, was found to be about 55 per cent—which is about 10 per cent higher than aluminum—gradually increasing to about 75 per cent in the visible spectrum (550 millimicrons), which is the same as aluminum.

# HEAT OF FORMATION OF WATER

One of the primary functions of the National Bureau of Standards is the determination of the standard constants. The heat of formation of water is one of the most important constants in thermochemistry because it is involved directly in the calculation of the heats of formation of practically all organic and of many inorganic compounds.

The usually accepted value for the heat of formation of water is based upon measurements made by Thomsen in 1873, Schuller and Wartha in 1877, and Mixter in 1903. The most reliable of these data are those of Schuller and Wartha, whose average value has an uncertainty of some 8 parts in 10,000, practically all of which lies in the calibration factor of their calorimeter.

The procedure employed in a recent investigation at the bureau was to determine directly the quantitative correspondence between the energy liberated by (1) the reaction of hydrogen and

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oxygen to form a weighed mass of liquid water and (2) a measured quantity of electrical energy, using the calorimeter as the absorber of the two quantities of energy and its temperature rise as the comparator. In so far as systematic errors are concerned, the absolute accuracy of the result obtained by this substitution method depends principally upon the determination of the mass of water formed, in grams, and of the quantity of electrical energy, in terms of the mean solar second and the international volt and international ohm as maintained at the National Bureau of Standards. High precision was obtained by the use of proper calorimetric technique, a sensitive potentiometric system for measuring the electrical power input, a precise timing device, and a suitable balance for weighing the water formed.

The data of two sets, each including the results of nine experiments, give for the heat of formation of liquid water, at 25° C. and a constant pressure of 1 atmosphere, 285,775 international joules per mole (18.0156 grams). The estimated uncertainty in this value is  $\pm 40$  joules. With the factors 1.0004 and 1.0004

this value is equivalent to 285,890 4.185 absolute joules and to 68,313 g-cal.<sub>15</sub>. The maximum and the average deviations of the experiments, in per cent, are, respectively: 0.031 and 0.019 in Set I; 0.024 and 0.010 in Set II.

The data of Schuller and Wartha, Thomsen, and Mixer, recomputed in terms of the international joule, are in substantial agreement with the value obtained in the present investigation.

This work will form the subject of a report in the January, 1931, number of the Bureau of Standards Journal of Research.

#### DETERMINATION OF MAGNESIUM IN PORTLAND CEMENT

The maximum amount of magnesia (MgO) allowed by Federal specification 1a and the standard specification for Portland cement (C9-26) of the American Society for Testing Materials, is 5.00 per cent (plus a tolerance of 0.4 per cent). Since a great deal of cement is purchased under these specifications it follows that many determinations of magnesia are required. At present the phosphate method is standard, and is quite accurate and proper for umpire analyses, but it is rather lengthy. The precipitation of magnesium by the reagent 8-hydroxyquinoline has been studied at the bureau, and in the January, 1931, number of its Journal of Research

a method is recommended for determining magnesium by use of this reagent. The recommended procedure is accurate and much more rapid than the standard phosphate method.

#### EXTRACTION OF BITUMINOUS-SATURATED FELTS

Federal specifications for bituminous-saturated felt for roofing and waterproofing purposes specify the weight of the moisture-free desaturated felt per 100 square feet, and require a piece of felt 2 inches wide and the full width of the roll (32 or 36 inches) to be desaturated for this determination.

For several months the bureau has used Soxhlet-type extractors for this purpose with very satisfactory results. The extraction tube of the apparatus used is of sufficient length to accommodate two samples rolled, and glass beads are added with the samples to reduce the volume of solvent, thus securing more frequent extractions per unit time. The vapor tube is insulated by wrapping with asbestos cord, and the vapors are condensed in a water-cooled, worm condenser. Heat is supplied by a small electric hot plate, and extractions are complete after several hours. For felts carrying a large percentage of bitumen the solvent should be changed after several extractions to prevent foaming.

This method is economical of both time and solvent, it is in accordance with the specification directions, and has the advantage of not exposing the operator to solvent fumes during the extraction.

#### PORTABLE INSTRUMENT FOR MEASURING AIR PERMEABILITY OF FABRICS

An instrument for measuring the flow of air through fabrics will be described in the January, 1931, number of the Bureau of Standards Journal of Research. The instrument, developed in the bureau's textile section, is self-contained and portable. A specimen is clamped between two orifice rings under a slight tension. Air is drawn through the fabric and through a calibrated orifice meter by a suction fan. The pressure drops across the fabric and across the orifice meter are measured, respectively, by inclined and vertical water gauges. The volume of air passing through the fabric at a given pressure drop is thus obtained. With a set of nine orifices ranging in diameter from 1 to 16 millimeters the flow of air may be measured for a wide variety of fabrics, ranging from closely woven to loosely knit constructions. Three typical air

permeability curves are shown. Typical data for two specimens taken from different portions of the same silk cloth are given and discussed. It is shown that the variation in air permeability because of the nonuniformities in the cloth is greater than the experimental uncertainty.

#### MEETING OF PAPER RESEARCH COMMITTEE

The central research committee of the American Paper and Pulp Association met with the paper section of the bureau, November 18, 1930. This is a joint committee of the American Paper and Pulp Association and the Technical Association of the Pulp and Paper Industry, appointed by the former to keep the paper industry informed on research developments and to act as a contact medium between these associations and organizations conducting such research.

This meeting was held at the invitation of the bureau in order that the committee might obtain detailed information on the paper researches in progress in its laboratories. Ernst Mahler, chairman, stated in opening the meeting that no action of an advisory nature would be undertaken by the committee until they had completed a national survey of the status of paper research.

At the request of the committee chairman and in response to inquiries from the committee members, the following subjects were discussed: Functions of the paper section as related to those of the other National Government laboratories; types of researches made and details of projects in progress; degree of coordination between these researches and those of similar type carried on elsewhere by the National Government; and detailed cost data of the researches and how they are financed. Relative to the last, the chairman complimented the bureau on the low cost of its paper research accomplishments.

At the completion of the joint meeting, the first meeting to be held by the committee, an executive session took place at which plans for its further studies of paper were developed.

All members of the committee were present except Dr. Bjarne Johnsen, who is abroad. The committee membership is as follows:

Ernst Mahler, chairman, vice president, Kimberly-Clark Corporation, Neeah, Wis.

M. Krimmel, president, Technical Association of the Pulp and Paper Industry, assistant director of research, Hammermill Paper Co., Erie, Pa.

R. G. Macdonald, secretary, Technical Association of the Pulp and Paper Industry, New York, N. Y.

Rex W. Hovey, director of research, Oxford Paper Co., New York, N. Y.

Dr. Bjarne Johnsen, director of research, Hammermill Paper Co., Erie, Pa.

Miss Helen U. Kiely, chief chemist, American Writing Paper Co., Holyoke, Mass.

W. G. MacNaughton, supervisor, newsprint division, International Paper Co., New York, N. Y.

R. H. Stevens, research department, Bogalusa Paper Co., Bogalusa, La.

Jesse H. Neal, ex officio, general manager, American Paper and Pulp Association, New York, N. Y.

#### EFFECT OF VARIATIONS IN COMPOSITION ON PROPERTIES OF VITREOUS ENAMELS

In an item which appeared on page 78 of Technical News Bulletin No. 160 (August, 1930) it was reported that enamels having identical calculated chemical compositions, but prepared from different raw mixes, had shown a distinct difference in softening temperature. It was further stated that any final conclusions concerning this observation should be withheld until the results of chemical analyses of the frits were available. When those results became available, differences in composition were shown to exist which would account for a difference in fusibility in the observed direction.

Repetitions of the experiment, which have been carried out since that time, confirm the observation that appreciable differences in fusibility occur when the enamels are prepared in refractory crucibles and are agitated during melting by continuous rotation of the crucibles. This is the method by which the enamels were initially prepared, of which the behavior was previously reported. When melted in stationary refractory crucibles with occasional stirring, the differences between enamels were less noticeable.

When the melting was carried out in platinum crucibles, no appreciable effect of variations in raw materials, to give the same calculated melted composition, was observed by means of cone deformation tests or "fusion block" tests. (Fusion blocks contain compartments for packing in a definite volume of powdered test material, which softens upon elevation of the temperature and flows down a steeply inclined plane bearing graduation marks. Under this test some enamels flow at considerably lower temperatures than others.) The batch mixes which were used to obtain the described results are given below. Each raw material was analyzed, and on



the basis of the results of analysis the batches were calculated to give as near as possible the same melted composition.

Material	Batch mixes	
	Parts by weight	Parts by weight
Borax.....	43.00	19.23
Feldspar.....	30.30	30.30
Quartz.....	29.76	
Sodium carbonate.....	8.92	
Sodium nitrate.....	5.00	5.00
Sodium silicate.....		39.19
Boric acid.....		15.67
Fluorspar.....	8.06	8.06
Cobalt oxide.....	.60	.60
Manganese oxide.....	1.94	1.94

The object of these tests was merely to determine whether or not any correlations which might be established between the compositions and the properties of typical ground-coat enamels now being studied would be vitiated by a radical variation in the raw batch used to obtain any given melted composition. It was incidentally noted that batches melted in the rotating refractory crucibles had somewhat elevated softening temperatures as compared to those melted in platinum.

#### DESTRUCTIVE WEATHERING OF ROOFING SLATE

How a natural rock composed mainly of inert minerals and possessing high strength as well as very low porosity is attacked by the weather is a problem of considerable interest to both producers and users of roofing slate. While slate roofs are commonly considered as among the most permanent types, there are instances where this material has not come up to expectations.

During the past year the National Bureau of Standards has studied this question with the particular object of devising specification tests. The study of weathered slates from roofs, together with numerous tests, have indicated that the decay is due to a combination of chemical and physical processes. Frost action apparently takes very little part in the decay until the material has been considerably altered from its original condition by certain chemical transformations.

It is a well-known fact that decayed slate usually shows the presence of quite appreciable amounts of gypsum, although the fresh slate is practically free from this substance. Some investigators have accounted for the formation

of gypsum in decayed slate by assuming that the small amounts of sulphuric acid in the air react with the calcitic impurities. This may account for a part of the gypsum, but it has been proved that this substance can also be formed in some slates by merely soaking and drying them several times. The formation of gypsum during the weathering process affords a clue to the cause of decay and indicates that the mineral impurities concerned in the reaction are calcite and pyrite, the necessary oxygen to complete the sulphate radicle being drawn from the air. Apparently free carbon, which is usually present in slate, aids the reaction. The conversion of calcite to gypsum brings about expansive forces within the slate, since the gypsum molecule requires more space than the calcite molecule. Scaling of the surface of the slate results, and this action is practically always more pronounced on the covered portion of the shingle than on the part exposed to the weather. This peculiar condition is probably caused by water penetrating between the shingles during rains and the slower rate of drying there than on the exposed surface. Laboratory experiments indicate that the formation of gypsum within the slate does not occur when the material is continually wet and that periods of moist conditions alternating with periods of dry conditions are necessary to cause the reaction. Slates having only a small amount of calcitic impurity are affected by this type of decay at a very slow rate. A very dense slate containing considerable calcite is not decomposed as rapidly as a more porous one with a similar calcite content. Some of our domestic roofing slates may be depended upon for more than 30 years of serviceable results while others are apparently good for more than 100 years.

#### CERTIFICATION OF BRICK

About 35 per cent of the 1,200 known common clay brick manufacturers and 75 per cent of the 48 known manufacturers of sand-lime brick have expressed their desire to be listed as sources of supply of brick guaranteed to comply with Federal specifications Nos. 504 and 505. Officers of the Common Brick Manufacturers Association and the Sand-Lime Brick Association are cooperating with the bureau in an attempt to have the whole membership of those associations represented on the bureau's willing-to-certify lists. The secretary of the American Face Brick Association, which maintains a research associate at the National Bureau of Standards for the investigation of

efflorescence, absorption, and transverse compression strength of face brick, is taking steps which may lead to the establishment of a commercial standard for face brick, to which the certification plan will be applied.

#### CERTIFICATION OF LUMBER

In the work of applying the certification plan to Federal specifications Nos. 24 and 533a for hardwood and softwood lumber, effective assistance has been received from the National Lumber Manufacturers Association and its affiliated organizations, the California White and Sugar Pine Manufacturers Association, California Redwood Association, the National Hardwood Lumber Association, the North Carolina Pine Association, the Northern Hemlock and Hardwood Manufacturers Association, the Northern Pine Manufacturers Association, the Southern Cypress Manufacturers Association, the Southern Pine Association, the West Coast Lumbermen's Association, and the Western Pine Manufacturers Association. All of these organizations have cooperated not only in the formulation of the standards, but in making them effective through the medium of the certification plan of the bureau and their own inspection services. Several of the associations have been of direct assistance in compiling the lists of willing-to-certify manufacturers of American Standard softwood lumber and in giving wide publicity to the bureau's plans in connection therewith.

Both the Hardwood Manufacturers Institute and the National Hardwood Lumber Association have been of definite assistance in the compilation of lists of willing-to-certify manufacturers of hardwood lumber complying with Federal specification No. 24 supplied under the grading and inspection rules of the National Hardwood Lumber Association.

Effective assistance has also been received from the only organization representing the wholesale lumber dealers—the National-American Wholesale Lumber Association.

The retail lumber dealers throughout the country are being reached through the cooperation of the National Retail Lumber Dealers Association and 28 regional associations affiliated therewith. Many of the regional associations have supplied mailing lists of their dealer members, and the Ohio Association of Retail Lumber Dealers has placed at the bureau's service its mailing facilities for reaching 13,676 dealers in all sections of the country.

The National Association of Builder's Exchanges, the National Association of

Purchasing Agents, and the National Builders Supply Association have placed on record officially their indorsement of the grade marking of lumber for the benefit of the purchaser and the protection of the seller.

#### NEW AND REVISED PUBLICATIONS ISSUED DURING NOVEMBER, 1930

##### Journal of Research<sup>1</sup>

Bureau of Standards Journal of Research, Vol. 5, No. 5, November, 1930 (RP Nos. 243 to 253, inclusive). Obtainable by subscription. (See footnote.)

##### Research Papers<sup>1</sup>

(Reprints from Journal of Research)

- RP211. An improved form of standard ionization chamber; L. S. Taylor and G. Singer. Price, 10 cents.
- RP212. Absorption measurements of the X-ray general radiation; L. S. Taylor. Price, 10 cents.
- RP213. Change of electrical properties of rubber and gutta-percha during storage under water; H. L. Curtis and Arnold H. Scott. Price, 10 cents.
- RP214. The resistance of steel to abrasion by sand; S. J. Rosenberg. Price, 15 cents.
- RP215. An improved Victor-Meyer molecular-weight apparatus; Mildred M. Hicks-Bruun. Price, 5 cents.
- RP216. Seams for copper roofing; K. H. Beij. Price, 15 cents.
- RP217. Apparatus for the measurement of high constant or rippled voltages; L. S. Taylor. Price, 10 cents.
- RP218. Compressive tests of bases for subway columns; J. H. Edwards, H. L. Whittemore, and A. H. Stang. Price, 10 cents.
- RP219. Dimensional changes caused in glass by heating cycles; A. Q. Tool, D. B. Lloyd, and G. E. Merritt. Price, 10 cents.
- RP220. Accurate method of measuring transmitted wave frequencies at 5,000 and 20,000 kilocycles per second; E. L. Hall. Price, 5 cents.
- RP221. Wind pressure on circular cylinders and chimneys; H. L. Dryden and G. C. Hill. Price, 15 cents.

<sup>1</sup> Send orders for publications under this heading with remittance only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 25 cents per year (United States and its possessions, Canada, Cuba, Mexico, Newfoundland, and Republic of Panama); other countries, 40 cents. Subscription to Journal of Research, \$2.75 per year; other countries, \$3.50. Subscription to Commercial Standards Monthly, \$1 per year; other countries, \$1.25.

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- C386. Specifications for the manufacture and installation of railway track scales for light industrial service (for knife-edge scales only). Price, 5 cents.
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Commercial Standards<sup>1</sup>

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Miscellaneous Publications<sup>1</sup>

- M115. Annual report of Director of the Bureau of Standards to the Secretary of Commerce for the fiscal year ended June 30, 1930. Price, 10 cents.

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